

THE TREX FINE-PARTICLE SPECTRAL LIBRARY OF MINERALS USING UV-VNIR-MIR OPTICAL DATA (REFLECTANCE, EMISSION, RAMAN). M. D. Lane¹, J. P. Allain², K. S. Cahill³, R. N. Clark³, E. A. Cloutis⁴, M. D. Dyar^{3,5}, J. Helbert⁶, A. R. Hendrix³, G. Holsclaw⁷, A. Maturilli⁶, M. Osterloo⁷, N. Pearson³, D. W. Savin⁸, and the Toolbox for Research and Exploration (TREX) team, ¹Fibernetics LLC (Lititz, PA, lane@fibergyro.com), ²University of Illinois at Urbana-Champaign (Urbana, IL), ³Planetary Science Institute, (Tucson, AZ), ⁴University of Winnipeg (Winnipeg, Canada), ⁵Mount Holyoke (South Hadley, MA), ⁶DLR (Berlin, Germany), ⁷University of Colorado (Boulder, CO), ⁸Columbia University (New York, NY).

Introduction: In order to study the dusty surfaces of airless bodies in the solar system using remote sensing, the TREX SSERVI team (trex.psi.edu) is developing a comprehensive spectral library that is focused on **fine-particulate (<10 μm)** planetary materials measured over **ultraviolet, visible/near-infrared, and mid-infrared (UV-VNIR-MIR;** ~0.12 to 33 μm) wavelengths under ambient or environmental conditions that mimic the surfaces of airless targets (*in vacuum and at various temperatures from ~ -180 to +300 °C*), when possible. Our spectral library will include these measurements acquired using reflectance, emission, and Raman spectroscopy. Although not included here, the spectral library also will include Mössbauer data of the TREX sample suite.

We will present the most recent spectra of a suite of terrestrial minerals (Table 1) (for our project's end-members, and eventual mineral mixtures and select mineral-ice mixtures) collected at collaborating laboratories (Table 2) with unique and overlapping capabilities.

Mineral Samples: We are finalizing the collection of spectra from a suite of 28 terrestrial **mineral** samples (Table 1). {Note: We also are preparing a suite of **meteorites** and **lunar** samples to be measured.}

Table 1. Terrestrial mineral samples.

Forsterite Globe*	Pyrite
Forsterite SC*	Palygorskite (PFI-1)
Bytownite CB*	CaS (oldhamite)
Labradorite Chihuahua*	Hectorite (SHCa-1)
Labradorite ARSAA	Nontronite (NAu-2)
Diopside Herschel*	Na-montmorillonite (SWy-3)
Augite Harcourt*	Ca-montmorillonite (STx-1b)
Albite (AL-I)	Kaolinite (KGa-1b)
Anorthite (AN-G)	Serpentine (UB-N)
Spinel ARSAA	Serpentine (SMS-16)
Phlogopite Mica-Mg	Ilmenite
Enstatite (Zen 1)	Zinnwaldite (ZW-C)
Hematite <5 μm	Fe metal <10 μm
Hematite 3 nm	Graphite 7-11 μm

*Samples being used by several SSERVI teams for cross-SSERVI collaborations & science linkages [1,2].

Participating Labs: Our team is continuing to upgrade and improve the labs' capabilities in order to fine-tune and increase the wavelength ranges, vacuum capabilities, calibration, and overall data quality.

Table 2. TREX laboratories.

Lab	Meas-urement	Wavelength	P, T
DLR	Reflect.	0.17–0.55 μm 0.4–1.1 μm 1–25 μm	0.7 mbar; ambient T
	Emission*	5 – 25 μm	Purged air; 80°C
	Reflect.	14.7–100 μm	Purged air; ambient T
	Emission*	5 – 20 μm	0.7 mbar; 150 & 300°C
Mount Holyoke	Raman	3 – 33 μm	Ambient
	Mossbau.	14.4 KeV	Ambient
PSI	Reflect.	0.12 – 0.22 μm 0.19 – 0.88 μm 0.35 to 2.5 μm	77 – 490K; <mbar to 1.5 bar
	Reflect. (future)	1.5 to 50+ μm	77 – 490K; <mbar to 1.5 bar
Univ. Winnipeg	Reflect.	0.16 – 0.4 μm 0.35 – 2.5 μm	Ambient
	Reflect. (future)	1.6 – 200 μm	<mbar; ambi- ent T
LASP	Reflect.	0.12 to 0.6 μm	1e-5 torr; 90K for ices
Univ. Illinois	Refl.; Ir- radiation	0.35 – 2.5 μm	<mbar P; 77- 900K
NASA- JSC	Impact sims	n/a	n/a

*MIR emissivity data acquired at DLR will be presented in depth in a poster at this conference. See [3].

References: [1] Byrne S. A. et al. (2015) *LPS XLVI*, Abstract #1499. [2] Dyar M. D. (2016) *SSERVI Expl. Sci. Forum*, nesf2016-043. [3] Lane M. D. et al. (2019) *SSERVI Expl. Sci. Forum*, NESF2019-088.